

【注意事項】

受験番号と氏名を全ての用紙に記入すること。
試験終了時に全ての用紙を回収します。

[問題] 以下の英文を読んで、下記の間1～4に答えなさい。

Most B and T cells die after an infection has been brought under control. But some of them survive for many years. They may even survive for a person's lifetime. These long-lasting B and T cells are called memory cells. They allow the immune system to "remember" the pathogen after the infection is over. If the pathogen invades the body again, the memory cells will start dividing in order to fight the pathogen or disease. These dividing cells will quickly produce a new army of B or T cells to fight the pathogen. They will begin a faster, stronger attack than the first time the pathogen invaded the body. As a result, the immune system will be able to destroy the pathogen before it can cause an infection. Being able to attack the pathogen in this way is called (1) immunity.

Immunity can also be caused by vaccination. Vaccination is the process of exposing a person to a pathogen on purpose in order to develop immunity. In vaccination, a modified pathogen is usually injected under the skin by a shot. (2) Only part of the pathogen is injected, or a weak or dead pathogen is used. It sounds dangerous, but the shot prepares your body for fighting the pathogen without causing the actual illness. (3) Vaccination triggers an immune response against the injected antigen. The body prepares "memory" cells for use at a later time, in case the antigen is ever encountered again. Essentially, a vaccine imitates an infection, triggering an immune response, without making a person sick.

In many countries, children receive their first vaccination at birth with the Hepatitis B shot, which protects infants from Hepatitis B, a serious liver disease. Before vaccines, many children died from diseases that vaccines now prevent, such as whooping cough, measles, and polio. Those same germs exist today, but because babies are now protected by vaccines, we do not see these diseases nearly as often.

[出典: Jessica Harwood and Douglas Wilkin, CK-12 flexbook, Immunity, CK-12 Foundation, September 23, 2018, Chapter 1, p1-2, [https://www.ck12.org/biology/immunity/lesson/Immunity-MS-LS/?referrer=concept_details\(CC BY-NC\)](https://www.ck12.org/biology/immunity/lesson/Immunity-MS-LS/?referrer=concept_details(CC BY-NC))]

[注] pathogen: 病原体、immunity: 免疫、inject: 接種する、shot: 注射、vaccination: ワクチン接種、antigen: 抗原、Hepatitis B: B型肝炎、whooping cough: 百日咳、measles: はしか、polio: ポリオ、germs: 細菌

問1 下線部(1)のimmunityと呼ばれる現象を本文の内容に沿って説明しなさい。(150字以内)

問2 下線部(2)を日本語に訳しなさい。(100字以内)

問3 下線部(3)のvaccinationがなぜ有効か、本文の内容に沿って説明しなさい。(150字以内)

問4 ワクチンができることによって、子供たちに起きた変化について説明しなさい。(100字以内)